Leader Errors and the Influence on Performance: An Investigation of Differing Levels of Impact

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Abstract

Errors will inevitably occur when one is involved in decision making tasks with complex, ill-defined problems. Qualitative research on this topic has illuminated the complex nature of problems faced by many leaders and organizations as they make decisions. Although this research has answered many questions about the nature of errors, empirical research on errors among leaders remains scarce. To further explore this topic, 170 undergraduates were assigned to one of five work conditions and asked to read three cases with initiating structure problems and three cases with consideration problems while taking on the role of the CEO in the scenario. Errors committed by leaders were examined to answer questions about how work conditions influence errors committed. Additionally, how these errors influence performance outcomes was also examined. Results indicated that work conditions paired with errors made by leaders influenced levels of performance. Under certain conditions, most notably process overload, errors led to negative performance. We also discuss the implications of these findings for understanding the influence of work conditions on errors committed and their combined influence on performance outcomes.

K.W.: leadership, errors, performance, decision making, planning

Leader Errors and the Influence on Performance: An Investigation of Differing Levels of Impact

Being a leader is a difficult, complicated role involving planning and decision making activities that will impact the lives of many people and organizations. These planning and decision making activities are not taken lightly; rather organizations often institute leader development seminars to assist in honing these skills as leaders advance in the organization (Burke & Collins; 2005; Dexter & Prince, 2007; Fulmer, 1997; Mulec, 2005; Pepe, 2007; Yeo, 2006). Decision making is one of the most important activities a leader engages in with numerous frameworks and recommendations to assist in developing a better process (Brousseau, Driver & Hourihan, 2006; Rausch, 2003; Ryan, 1995; Snowdon & Boone, 2007). As leaders advance they increasingly generate solutions to complex organizational problems. These problems become more complex and ill-defined as they move up the organizational hierarchy (Mumford, 2006). When developing solutions to these problems errors may occur due to the intense pressures faced by leaders. These errors may in turn lead to problems with performance. Therefore, this study takes a two part approach by first assessing the influence of problem type and work conditions on errors and then measuring the influence of problem type and work conditions paired with errors on performance.

We have chosen to look at errors in the context of planning and decision making, applying a case-based reasoning model because cases are necessary to developing a plan (Berger & Jordan, 1992; Patalano & Seifert, 1997) and it is often during the planning process that decisions are made and errors can occur (Mumford, Friedrich, Caughron & Byrne, 2007).

It is not difficult to cite decision making errors that have occurred among executives, many of which lead to struggling times for their companies. Finkelstein (2003) outlines the stories of several companies that once at the top of their game, end up in disarray. Although these case studies provide valuable information about the errors that leaders make and the potential for failure of various companies, they do not provide an empirical look at leader errors. Unfortunately the empirically driven studies that have been completed in this area have not necessarily focused on complicated leader tasks. Rather, the focus of error research has been primarily in aviation and the medical field.

There are numerous studies of errors directly related to performance outcomes that are committed by pilots, resulting in accidents (Baker & Krokos, 2007; Li & Harris, 2006; Li, Harris, & Chen, 2007; Xu, & Rantanen, 2007). There is also a significant body of research in the area of medical errors; leading to the deaths of 98,000 Americans each year (Bauer & Mulder, 2007; Henry, 2000; Peters, Slovic, Hibbard, & Tusler, 2006; Veazie, 2006). In fact several error taxonomies have been developed in the areas of aviation and medicine (Joyce, Boaden, & Esmail, 2005; Rasmussen, 1982; 1988; Sutcliffe & Rugg, 1998; Zhang, Patel, Johnson, & Shortliffe, 2004). While these examples show direct error-performance linkages, one could argue that in business settings there is more distance between the error committed and the performance outcome. In a similar contrast to aviation and medical errors, outcomes of errors in business settings are often not readily apparent. For example, it generally takes time to go through the business cycle and determine the impact on the bottom line. After that, a connection must be made between the outcome and the error committed to identify the direct influence (i.e., cause of

error). Therefore, caution should be taken when generalizing the findings discussed above to other settings, such as businesses and the errors made by leaders.

With the exception of the work by and Zhao and Olivera (2006), very little has been done to study leader errors through experimental methods. Recently there was also a historiometric study of leader errors by Bedell-Avers, et al. (in press). However, we are uncertain what specific types of errors leaders commit or what effects these errors may have on problem solving. As the concept of leader errors is somewhat complex, it is essential to first establish a definition of errors in the leadership domain.

Error Definition

Errors are often described in reflective terms after the outcome is known. Zapf and Reason (1994) have described errors as occurring when a goal is not reached. Additionally, others have argued that errors be considered avoidable (e.g., Brodbeck, Zapf, Prumper, & Frese, 1993; Norman, 1981; Reason, 1990). Therefore, Zhao and Olivera (2006, p. 1013) define errors as decisions and behaviors that "(1) result in an undesirable gap between an expected and real state and (2) may lead to actual or potential negative consequences for organizational functioning that could have been avoided". Hunter, Tate, Dzieweczynski, and Bedell-Avers (in press) proposed a new definition of leader errors as occurring when "an avoidable action (or inaction) is chosen by a leader which results in an initial outcome outside of the leader's original intent, goal, or prediction". One could argue that some errors result in larger problems than others. For instance, there may be some errors made that have little impact or even positively influence performance outcomes (Cuschieri, 2003; Keith & Frese, 2008; Lorenzet, Salas, & Tannenbaum,

2005). Conversely, there may be other errors that lead to the downfall of a company. Therefore, errors committed and subsequent performance can be seen as two separate outcomes.

Research Purpose

An experimental design was chosen for the purposes of this study given the limited understanding of how work conditions, problem types, error types, and performance variables would interact with one another. Providing undergraduates with scenarios in which they took on the role of a CEO allowed us to have a high degree of control over these variables of interest. Thus, in the current study, an attempt was made to identify what types of leader errors, made during decision making and planning activities, lead to the most severe performance outcomes. For this reason, both errors committed and performance outcomes were important to consider. Additionally the type of problems encountered was also considered. In the realm of leadership research, the questions remain as to how a leader's cognitive framework, as molded by work condition and problems encountered, is related to errors and what specific types of errors subsequently lead to the poorest performance outcomes. Therefore, this project takes a two part look at leader errors. First, part one addressed the types of errors committed based on problems encountered and work conditions. Previous efforts in the area of human errors have reflected the importance of work conditions on the types of errors committed. For example, Rasmussen (1988) found that internal errors occurring during decision making and planning were related to highly skilled activities taking place in complex work environments. As work conditions do appear to be an important influence on errors committed (Rasmussen, 1988), understanding the relationship between work conditions and errors committed in the leadership domain will

advance our understanding of this little explored leadership topic so that the most devastating work conditions may be altered.

Second, part two addressed how these errors influence performance outcomes. Behaviorists would claim that all errors are bad and result in punishment which is to be avoided (Skinner, 1953). Some claim that in terms of training, if individuals are not allowed to make mistakes, they become sheltered (Lorenzet, Salas, & Tannenbaum, 2005). While the purpose of this article is not to hail the benefits of errors, we do hope to illustrate that all errors are not created equally in terms of severity of consequences (Cuschieri, 2003). If there is a difference in the expression of errors – positive, neutral, negative – it is important to realize the nature of those errors related to negative outcomes so that they may be minimized.

Decision Making and Planning

Leader errors are often discussed as decisions made during the planning process. Planning often involves accessing case based knowledge or schema abstracted from past experiences and adjusting this knowledge when encountering a similar problem. Mumford, Bedell, and Hunter (2008) describe these schematic representations as a library housing prototypic cases along with key exceptions. The relevant cases in this "library" include information about goals, outcomes, causes of outcomes, contingencies and restrictions, and actions taken. This information found in the "library" and how it is then used influences decisions that are made. Therefore decision making occurring during leaders planning processes is relevant in the discussion of errors (Berger & Jordan, 1992; Hammond, 1990; Hershey, Walsh, Read, & Chulef, 1990; Mumford, Schultz, & Osburn, 2002) and appropriate for the focus of this study.

Case Based Knowledge

Causal models are often utilized when leaders are interpreting problems and subsequently engaging in decision making. Creativity is also often used when solving problems. Relying on familiar causal relationships when interpreting problems may thus lead to case based errors in creative thought (Blair & Mumford, 2007; Dailey & Mumford, 2006; Dörner & Schaub, 1994; Hogarth & Makridakis, 1981; Licuanan, Dailey, Mumford, 2007; Mumford, Blair, Dailey, Leritz, & Osburn, 2006; Woodman, Sawyer, & Griffin, 1993). When these familiar causal models are being attended to, information falling outside of the extant model will be discounted (Kuhn, 1970; Watkins, 1983). Lastly, experts tend to have multiple well-structured exemplars from which to access relevant cases that can result in a decreased influence of new information. However, new information may have a stronger impact if such exemplars were less well formulated.

Although some new information may be overlooked, it is necessary for leaders to develop strategies for handling vast amounts of incoming information. Cognitive shortcuts such as heuristics are used to overcome the limitations of working memory. These shortcuts allow a leader to draw from personal experience in a search for information and build an interpretive framework (Wright, 1974; Hambrick, Finkelstein, & Mooney, 2005; Hambrick & Mason, 1984). The resulting effect may be the likelihood that experts overlook new information in idea generation (Mumford, et al., 2006) and it may lead to less complete solutions (Shah & Oppenheimer, 2008). The strategies used by leaders as well as the work conditions the leaders experience when engaging in planning and decision making activities may influence errors made and subsequent performance.

Work Conditions

Different types of errors can occur under particular working conditions which can in turn lead to varying influences on performance. These work conditions in this study are 1) causal relationships (the influence of case components on one another is emphasized), 2) understanding constraints (identifying barriers to success and how to work around them is emphasized), 3) irrelevant information (distraction information is present that falls outside the general case framework), and 4) processing overload work conditions (vast amounts of information is processed in a restricted amount of time). These work conditions play a significant role in influencing decisions that are made, errors that can occur, and performance levels. For example when leaders are faced with processing overload it is often not only the overwhelming amount of information leaders need to synthesize before arriving at a decision, it is the short amount of time in which this activity must occur that adds to restricted capacity. De Dreu (2003) investigated the role of time pressure in a negotiation setting. The data from this study indicated that time pressure hinders success by reducing our motivation to engage in systematic information processing. Thus, we have our first hypothesis:

> *Hypothesis one: Leaders will make more errors under work conditions with processing overload versus work conditions emphasizing causal relationships, understanding constraints, or irrelevant information.*

Although there is little testing of cognitive errors made by leaders, four types will be the focus of the current effort based on previous studies of information processing among leaders. The errors that are the focus of this study occur when making decisions during planning activities. These include causes and goals, contingencies and restrictions, incongruent

information, and restricted capacity. These errors were selected for several reasons. First, each can result from an inaccurate processing of information relating to the model of case based reasoning. Second, there has been a discussion of these errors in cognitive processing in the leadership literature, but they have not been examined in an empirical study. Although conducting such a study with leaders in a more natural setting is highly desirable, initially an experimental setting will allow for more control over these complex processes. Lastly, the tendency to commit these errors can be manipulated in a controlled environment. We will now examine these error types in greater detail.

Causes and Goals

Key causes and key goals are abstracted from experience when people access the mental models related to their current situation. (Strange & Mumford, 2005). The tendency to then impose an extant causal model on the interpretation of a current circumstance may lead to errors in creative thought (Woodman, Sawyer, & Griffin, 1993). Moskowitz and Sarin (1983) found that when manipulating information presented to security analysts, (i.e., causal versus diagnostic), they found that people tended to rely on known causal relationships when assessing a situation. This can lead to errors when these familiar causal understandings are not relevant.

Contingencies and Restrictions

The second type of error, contingencies and restrictions relates to the idea that accurate framing of actions necessary to be successful as well as barriers to success must be present to avoid errors. In essence, leaders need to be able to identify contingencies and restrictions they can control or remove (Mumford et al., 2002). It is the careful assessment of restrictions that might be used to eliminate certain decision options (Baughman & Mumford, 1995). In framing a

problem, accurately identifying restrictions also directs attention to engage in the search for significant constraints that must be overcome to achieve a successful result to a proposed solution (Mumford, Baughman, Threlfall, Supinski, & Costanza, 1996; Mumford, Supinski, Baughman, Costanza, & Threlfall, 1997). According to case based analysis, leader performance will depend on the accurate framing of critical aspects of the case (Mumford, et al., 2007). When causes and goals errors are made, the mental model the leader was relying on was not appropriate in the current situation. However there are many instances in which these mental models can act as shortcuts and will prove useful and result in appropriate solutions (Wright, 1974; Hambrick, Finkelstein, & Mooney, 2005; Hambrick & Mason, 1984). Conversely, contingencies and restrictions errors contain many moving pieces (i.e. correctly identifying all the contingencies and restrictions in a situation, rather than activating a known causal relationship) and therefore provide more opportunities to commit an error. Thus, we have hypothesis two:

Hypothesis two: Contingencies and restrictions errors will be committed more frequently than causes and goals errors.

Incongruent Information

The third type of error that will be investigated is incongruent information. It can be defined as the relevant information falling outside the individual's interpretive framework (Mumford, et al., 2006). As categories for organizing information become sharply defined with respect to attributes of relevant exemplars information incongruent with their framework can be discounted (Lee, MacGregor, Bavelas, Mirlin, Lam, & Morrison, 1988). When there is sharp concept differentiation, as with incongruent information, the conceptual combinations and

generation of new ideas are more likely due to the large numbers of concepts that people have to work with. The challenge is that the more concepts people have to work with, the more difficult conceptual combinations become. This becomes particularly complex, in that at times anomalous information may be relevant to the situation while at other times may not. Judgments about the relevance of information is influenced by both the individual's intent and the conceptual structures used to approach available information (Blaylock & Rees, 1984; Hilton & Swieringa, 1982; Lowe & Steiner, 1968). Because at times this incongruent information may indeed be relevant, these errors may not have the same negative influence on performance as the other errors described. Therefore we have hypothesis three:

> *Hypothesis three: Incongruent errors will result in fewer performance detriments than causes and goals and contingencies and restrictions errors.*

Restricted Capacity

Restricted capacity errors relate to the idea that overwhelming attention capacity may result in an overly extended initial search reducing flexibility and constraining subsequent processing activities (Mumford, Baughman, & Sager, 2003). Over time categories become strongly structured through the availability of many well defined exemplars. Thus, the addition of new exemplars has less impact on category structures (Mumford et al., 2003). This category of errors occurs as a result of excessive processing demands or high workload (Ayres, 2001; Veazie, 2006). Rather than fully exploring the library of cases, leaders settle on the first relevant case that is activated. Because of the high-pressured nature of a leader's job in terms of amount of information presented and speed with which complex problems must be solved, we propose hypothesis four:

Hypothesis four: Restricted capacity errors will occur more frequently than causes and goals, contingencies and restrictions, or incongruent information errors.

Performance

Evaluations of leaders can range from the perceptions of shareholders, stock prices, or simply the bottom line. Regardless of which measures of performance are used, at some point the decisions that the leader makes are judged. As previously discussed, these decisions are most often related to planning activities that can set or change the course of the organization. Restricted capacity errors may prove most detrimental because the solution may not consider the newness and unique aspects of the current situation. Therefore the solution provided may not fully address the problem. The result is a poor decision based on sub-optimal information searches due to an overwhelmed attention capacity (Bukszar, 2003). This means that the framework relied on for decision making will be inaccurate. Thus we have hypothesis five:

Hypothesis five: Restricted capacity errors will lead to more performance problems than causes and goals errors, contingencies and restrictions errors, or incongruent information errors.

Problem Type

Two dimensions that have been traditionally researched in leadership are that of initiating structure and consideration. This two-dimensional taxonomy of leader behavior was developed through a series of studies of studies at Ohio State University and University of Michigan during the 1950's (Fleishman, 1953; Halpin & Winer, 1957; Hemphill & Coons, 1957). Problems relating to one type of situation versus another may influence individuals to access cases in

different ways. For example, leaders that excel in initiating structure situations think in terms of standards, rules regarding work duties, and consequences of reaching or not reaching goals (Judge, Piccolo, & Ilies, 2004). When encountering this type of problem leaders may search for rules they are aware of that have guided them in similar situations. It would appear that deviations from these strict rules and standards would be highly visible in leaders exhibiting this quality. Therefore, their errors may be more obvious and have stronger consequences. Given the nature of initiating structure problems, one could conclude that there are fewer degrees of freedom as to what decisions result in error as compared with other types of problems. Conversely, leaders exhibiting strength in consideration have a tendency to be engaged in concern for the welfare of others (Judge, Piccolo, & Ilies, 2004). Because consideration problems include people-oriented, interpersonal issues that allow for greater flexibility in the solutions that are developed, there may be a tendency for fewer performance problems to appear. Therefore, we have our final hypothesis:

> *Hypothesis six: Errors occurring when working on initiating structure problems will lead to more performance problems than errors occurring when working on consideration problems.*

Method

Sample

To test these hypotheses, 170 undergraduates were recruited from a large southwestern university. The 69 men, 77 women and 24 gender unreported students enrolled in undergraduate psychology courses reviewed the experiments available for extra credit and selected to participate in studies of interest to them. The average age of participants was 20 and the majority

were in their freshman year. Academic ability was generally high, with Scholastic Aptitude Test scores falling a quarter of a standard deviation above national norms for freshman entering four year institutions.

General Procedure

Students recruited to participate in this study were asked to make a series of decisions and develop problem solutions as if they were CEOs of companies described in the cases. Individuals were not asked to draw conclusions about their own performance, because there is evidence that individuals are poor at recognizing cognitive errors such as thinking, decision making, perception, etc. (Cuschieri, 2003), rather they made decisions and developed novel problem solutions. Work condition was assigned at random and case order was counterbalanced to prevent ordering effects. Participants were randomly assigned to one of five work conditions; causal relationships, understanding constraints, irrelevant information, processing overload, and a control condition. These work conditions will be described in the upcoming sections. After paper and pencil materials were distributed, participants signed an informed consent form. The first half hour of this study consisted of a series of timed individual differences measures. After completing the timed measures, some participants were provided strategies for identifying important information in a scenario that could be used when making decisions, thus influencing their framework and priming them for certain types of errors. Next, participants were allowed to work through a series of six scenarios in which they were asked to take on the role of a CEO making decisions and providing problem solutions for a company on the brink of bankruptcy as described in the case. Questions were then presented to assess their framing of the situation which was the basis for identifying type and intensity of errors committed. At the end of each of

these scenarios, participants were asked to develop a creative solution to the problem that was presented in the scenario. Once these scenarios were completed, participants completed another set of untimed individual differences measures, were debriefed, thanked for their participation, and dismissed. The study session lasted approximately four hours.

Individual Differences Measures

Several factors that had the potential to influence the results of our study were assessed in a covariate battery. For example, if a person is particularly conscientious or intelligent they may perform at higher levels than others. By including a battery of measures that could potentially influence our results, covarying these influences out of our analysis removes variance associated with these variables from further analyses. Thus, a true picture of performance differences above and beyond those resulting from intelligence for example, is obtained. Based on research by Vincent, Decker, and Mumford (2002), three cognitive capabilities believed to interact with leadership and creative problem-solving were evaluated. These measures include divergent thinking, expertise, and intelligence – all shown to influence creative problem-solving.

Divergent thinking was assessed using Guilford's Consequences A Test (Guilford & Hoepfner, 1971). This measure includes 5 questions where individuals are asked to anticipate the outcomes of unlikely events and record them in list form (e.g. "What would be the results if everyone lost the ability to read and write?"). Answers were scored for fluency, or the number of unique responses recorded, and flexibility, or the number of categories that responses fall into. This measure yielded internal consistency coefficients above .80. Evidence for the construct validity of this measure of divergent thinking may be found in Merrifield, Guilford, Christensen, and Frick (1962) and Vincent, Decker, and Mumford (2002).

Next, a business expertise measure was developed using a variation on the procedures used by Scott, Lonergan, and Mumford (2005). This measure took the form of 12 background data questions (Mumford, Stokes, & Owens, 1990) examining exposure to and involvement in business classes and issues (e.g., “To what extent have you successfully developed a solution to a problem at work?” or, “To what extent have you worked in a role that included management and/or leadership?”). After scaling, these questions produced an internal consistency of .81. The purpose of this experimental measure was to provide information about prior exposure to the type of problem solving task used in the study.

Then, a measure of wisdom, the 3D-WS (Ardelt, 2003) was administered to participants. This measure assesses cognitive, reflective, and affective components of wisdom. Additional information about the reliability and validity of this instrument can be found in Ardelt (2003). Lastly, intelligence was assessed using an analogical reasoning measure by Ruch and Ruch (1980). This measure consists of 30 items in which the participant is presented with a series of facts for which they must determine whether conclusions drawn are true, false, or unclear. The test-retest reliability coefficients for this measure are in the .80s. Further evidence for the validity of this test as an appropriate measure of intelligence can be found in Ivancevich (1976) and Ruch and Ruch (1980).

In the next set of measures, participants completed Goldberg’s Unipolar Measure of personality (1978) designed to assess the personality traits of neuroticism, extroversion, openness, agreeableness, and conscientiousness. This instrument presents participants with 100 self-descriptive words (e.g. quiet, bold, kind) and they are asked to indicate on a 9-point scale how accurate these words describe them relative to their peers. Evidence for the validity of these

scales can be found in Reysen (2005), Saucier (2002), Conway and Peneno (1999), and Becker, Billings, and Eveleth (1997).

Finally, participants completed a planning measure. This measure developed by Marta, Leritz, and Mumford (2005) consists of a series of scenarios to which individuals provided answers to planning related issues such as identification of key causes, restrictions, downstream consequences, use of opportunistic implementation strategies, and effective environmental scanning. These questions produced internal consistency ratings in the upper .80's. A correlation matrix can be found in Table 1 which indicates the relationships between all covariates and core study variables.

Insert Table 1 About Here

Problem Type

Six cases were given to each participant. Three of the cases contained process oriented (initiating structure) problems and three of the cases consisted of interpersonal (consideration) problems. These two dimensions have been shown to account for leader emergence and performance (Fleishman, 1953, 1973; Hemphill & Coons 1957; Shartle, 1956) and frequently appear in leadership studies, providing the groundwork for theory development (Yukl, 2006). Each of the cases followed a similar format regardless of problem type and were approximately 2 pages in length. Case scenarios were developed based on real companies that have faced many challenges.

Work Conditions

Participants were asked to operate under one of five work conditions. These work conditions consisted of causal relationships, understanding constraints, irrelevant information, processing overload, and a control condition in which they only received the scenarios and questions. Each of the work conditions contained the same scenarios and two sets of questions. Participants answered the same two sets of questions for each case. The first set included the following two questions: 1) "What are 5-8 strengths of this company?" and 2) "What are 5-8 weaknesses of this company?" The purpose of these first two questions was to help participants internalize the case information, but the responses were not scored. The second set included the following 8 questions: 1) "What 5-8 unforeseen events about the case are important to consider?", 2) "What 5-8 limitations about the case are important to consider?", 3) "What 5-8 details about the case are important to consider? Prioritize these details based on importance by numbering each detail with 1 being the most important detail.", 4) "What 5-8 key events in the case are important to consider?", 5) "What 5-8 desired outcomes in the case are important to consider?", 6) "If you were the leader of this company, what would you do?", 7) "What kind of actions would you take to turn this company around?", and 8) "What kind of improvements would you implement?" Each work condition is described in detail below.

Causal relationships. Before receiving the six cases, participants that were in the causal relationships work condition received information in a self-paced format describing these concepts. They then practiced identifying causes and goals in an example case. Initially, participants were provided with definitions of causes and goals. Then they read a brief illustration: "If you study hard for a test you are more likely to earn good grades. The cause in this example is studying and the goal is good grades." Next they were presented with a small

scenario. There was then a short discussion about identifying causes and goals. Finally, participants were presented with a longer scenario and asked to identify causes and goals within the scenario. Once they had recorded their responses, they were able to review the correct responses agreed upon by three psychologists, appearing on the next page of their materials. Next these participants received three cases with initiating structure type problems and three cases with consideration type problems. They were instructed to read each case and answer question sets one and two following each scenario. These questions were consistent across all manipulations. They proceeded through each case in the same manner until all six cases were complete.

Understanding constraints. Upon beginning the task, participants that were in the understanding constraints work condition received information in a self-paced format describing the constructs of contingencies and restrictions. First, participants were provided with definitions of these concepts. Next, they were presented with a brief illustration: "You may really want to go out to dinner, but are trying to save money. Saving money would represent a restriction on your desire to go out to dinner." Then participants were allowed to practice identifying contingencies and restrictions in an example case. Next they were presented with a small scenario. There was then a short discussion about identifying contingencies and restrictions in the scenario. Finally, participants were presented with a longer scenario and asked to once again identify contingencies and restrictions. Once they had recorded their responses, they were able to review the correct responses agreed upon by three psychologists appearing on the next page of their materials. As was the case in the causal relationships work condition, participants received three cases with initiating structure type problems and three cases with consideration type problems. They were

instructed to read each case and answer question sets one and two following each scenario. They proceeded through each case in the same manner until all six cases were complete.

Irrelevant information. Participants in the irrelevant information work condition were also presented with six cases, three containing initiating structure type problems and three containing consideration type problems. In this work condition, participants began the task by reading the first case. They then responded to the two questions in the first question set to help them absorb the case information. The questions were: 1) "What are 5-8 strengths of this company?" and 2) "What are 5-8 weaknesses of this company?" After answering these questions, participants received irrelevant information in the form of bullet points. This additional information was presented as an anomaly falling outside of the general framework of the case. After reviewing the irrelevant information, participants received question set two. Participants then continued through this process with the remaining five cases.

Processing overload. In the processing overload work condition, participants were presented with the same six cases as all the other manipulations, three cases contained initiating structure type problems and three contained consideration type problems. At the beginning of the task, participants were informed that they would be timed and were given 25 minutes to read the material from the first case and answer all the questions. Pilot studies were conducted to determine the average amount of time to complete this task. This amount was then reduced by 30% for individuals in this work condition to induce time pressure. Participants were notified when they had 10 and 5, and 2 minutes left to complete each scenario, so they could manage their time effectively. Their attention was directed to a clock so they could monitor their time. Participants then began by reading the first case. They answered the first question set: 1) "What

are 5-8 strengths of this company?" and 2) "What are 5-8 weaknesses of this company?" with the intent of internalizing the case information they had read. Next, participants were presented with a full page of additional details about the case. Finally, participants answered question set two. Participants continued through the remaining five cases in this manner until they were complete.

Scoring

Each error score was determined using a set of criteria. As previously noted, questions one and two from the first question set 1) "What are 5-8 strengths of this company?" and 2) What are 5-8 weaknesses of this company?" were not scored. The responses to questions one through five in the second question set were 1) "What 5-8 unforeseen events about the case are important to consider?", 2) "What 5-8 limitations about the case are important to consider?", 3) "What 5-8 details about the case are important to consider? Prioritize these details based on importance by numbering each detail with 1 being the most important detail.", 4) "What 5-8 key events in the case are important to consider?", 5) "What 5-8 desired outcomes in the case are important to consider?" were used to assess frequency and extent of each of the errors committed. The intent of these questions was to assess the framework of those in the study. The responses to questions six through eight 6) "If you were the leader of this company, what would you do?", 7)"What kind of actions would you take to turn this company around?", and 8) "What kind of improvements would you implement?" were used to assess performance outcomes. Responses to these questions presented in each of the 6 cases were evaluated by the four expert judges on a 5 point Likert scale to determine error types committed. Causes and goals errors were scored using the following criteria: To what extent was there 1) lack of identification of important causes and goals, 2) discounting of key relations, 3) failure to consider multiple

consequences, 4) emphasis on threats over opportunities, 5) over-reliance on salient information source. All of these elements indicate an incomplete or unbalanced causal framework. In essence, these criteria indicate an unclear understanding of the causal interactions in the case. For example, focusing only on threats rather than also identifying opportunities indicates a limited grasp of how threats in one area could lead to opportunities in other areas. The internal consistency for the five elements making up this measure of causes and goals errors was .68.

Contingencies and restrictions errors were assessed using the following criteria: To what extent does the solution 1) have quality of contingencies and restrictions (reverse scored), 2) ignore contingencies, 3) ignore restrictions, 4) focus on wrong contingencies, 5) focus on wrong restrictions, 6) fail to identify interactions between contingencies and restrictions. All these elements indicate poor understanding and integration of contingencies and restrictions. The internal consistency for the six elements making up this measure of contingencies and restrictions errors was .71. Incongruent information errors were assessed using the following criteria: To what extent does the solution exhibit 1) concept restriction, 2) over-reliance on salient incongruent information, 3) discounting incongruent information, 4) failure to integrate congruent and incongruent information, 5) over-reliance on salient congruent information. These elements indicate poor understanding of incongruent information. For example, if a participant has a unbalanced perception of the situation and fails to consider incongruent information or conversely builds his or her entire solution around one piece of incongruent information, he or she would not have considered the information presented in a balanced manner. The internal consistency for the five elements making up this measure of incongruent information errors was .60. Finally, restricted capacity errors were assessed with the following criteria: To what extent

does the solution exhibit 1) failure to prioritize key information, 2) oversimplified responses, 3) failure to organize information, 4) failure to integrate old and new case information, 5) focus on limited amount of information. These criteria indicate that an individual has an incomplete or restricted perception of the situation. The internal consistency for the five elements making up the measure of restricted capacity errors was .83.

Performance Outcomes

Performance was assessed using several criteria. First creativity was evaluated using three criteria: quality, originality, and elegance as defined by Besemer & O'Quinn (1999). In addition, adaptability to changes in the company and reflection on mistakes made by previous company leaders were assessed. A variation on consensual rating techniques developed by Redmond, Mumford, and Teach (1993) was employed. Quality solutions were defined as exceptionally logical and including all necessary elements for establishing solving this company's problems in a complete and coherent manner. Original solutions were defined as ones which are clearly unique containing core elements that appear wholly original with clarity of what it would look like for the company and what actions would need to be taken. Elegant solutions were defined as ones in which the elements of the solution fit exceptionally well together using only the minimum number of elements to achieve maximum effectiveness. Adaptable solutions were defined as those that consider the changing nature of the company and its' environment. Solutions exhibiting Reflection were those that discuss previously committed errors in reference to current decisions being made. See Figure 1 for example rating scales.

Insert Figure 1 About Here

Rater Training

Four Ph.D. candidates in Industrial Organizational Psychology acted as expert judges to evaluate level of error committed and performance outcomes. Before beginning the ratings, the expert judges participated in a 20-hour session where they came to a consensus in identification of contingencies and restrictions and incongruent information in each of the cases. These two error types were determined to be less objective constructs for evaluation. These classifications of information were then used as a reference to aid in the rating process.

Next, judges participated in a 40-hour training session where they practiced rating sample participant packets representing varying levels of errors and performance outcomes. After the first set of ratings, internal consistency coefficients were computed and feedback was provided by one of the investigators. Judges then rated a second set of packets. After these ratings were completed, discrepancies were discussed and decision rules were clarified. Following this training, interrater agreement coefficients for evaluations of errors were at satisfactory levels for causes and goals (.81), contingencies and restrictions (.68), incongruent information (.62), and restricted capacity (.67) and for evaluations of plan quality, originality, elegance, adaptability, and reflection were .90, .81, .70, .81, and .80 respectively. These levels were determined to be satisfactory to ensure reliability among the raters and the remainder of the participant packets were then evaluated.

Because the internal consistency was high between items comprising each error type, total error type scores were computed by summing the averaged judges scores from each of the elements measuring the error types, and then dividing by the total number of components to

create an error score for each error type. For example, if an individual received a 5, 5, 4, 3, and 3 for each of the elements making up restricted capacity, these scores would be summed and divided by 5. The resulting error score for restricted capacity would be 4.

Analyses

Two sets of multivariate analyses were conducted to address the hypotheses. First, for analysis one the effects of work condition and problem type on error severity were assessed to test hypothesis one, two, and four. In the first analysis a MANCOVA was conducted with the independent variables being work condition as a between subjects factor and problem type as a within factor. The dependent variables were causes and goals, contingencies and restrictions, incongruent information, and restricted capacity errors.

Then for the second set of analyses to test hypotheses three, five, and six, how errors committed influence the quality, originality, elegance, adaptability, and reflection were assessed as exhibited in the solutions developed by the participants taking on the role of the CEO of a company in a dire situation. Because of the large number of performance variables, five for consideration problems and five for initiating structure problems, a factor analysis was conducted to see whether these variables could be grouped in to factors. After conducting the factor analysis, one performance factor emerged for consideration problems and one performance factor for initiating structure problems. See the factor analysis results in Table 2.

Insert Table 2 About Here

Thus, to address hypotheses three, five, and six another MANCOVA was conducted with the independent variables being work condition and error committed as between factors and problem type as a within factor. The performance outcome factors for consideration and initiating structure problems made up of quality, originality, elegance, adaptability, and reflection served as the dependent variables. Covariates were only retained if they were significant at the .05 level for both sets of analyses otherwise they were dropped.

Results

Analysis 1 Results

General findings indicated that contingencies and restrictions errors were made more than any other type of errors for both initiating structure cases (82) and consideration cases (93). This finding was in support of hypothesis two as contingencies and restrictions errors were proposed to be more likely to occur than causes and goals errors. Causes and goals errors were the second most frequent with 47 errors for initiating structure cases and 39 errors for consideration cases, followed by restricted capacity with 36 errors for initiating structure cases and 33 errors for consideration cases. Therefore hypothesis four stating that restricted capacity errors would occur more frequently than all other error types was not supported. In fact participants appeared to perform well in regard to integrating and prioritizing all aspects of the cases. It may be that this error did not occur as frequently as expected since work pressures normally experienced by leaders were not in place for all work conditions. Finally incongruent information errors with a total of only five individuals (1 for initiating structure cases and 4 for consideration cases) committing an incongruent information error to a greater extent than the other three types of errors. Because of this small number, we were unfortunately unable to obtain meaningful results

for incongruent information errors. Thus, this variable was removed from remaining analyses. Because of this, hypothesis three stating that incongruent information errors results in fewer performance detriments than causes and goals and contingencies and restrictions errors was unable to be tested.

Table 3 presents the results of examining the error frequencies for initiating structure and consideration problems. Intelligence proved to be a significant covariate F (4,161) = 3.59, p = .01 and was retained in this analysis. The other covariates did not reach significant levels across analyses and therefore were not retained. There were significant main effects for work condition F (4,164) = 9.29, $p < .001$ and problem type F (4,161) = 2.80, $p < .05$. Additionally, there was a significant interaction between problem type and work condition F (4,164) = 3.71, p = .01.

Insert Table 3 About Here

Next, a separate set of univariate analyses of covariance were conducted to determine differences among select groups with respect to the extent to which error types were committed. After examining the results of the ANCOVAs (see Table 4), the central findings indicated that processing overload work conditions led to high levels of causes and goals errors, and contingencies and restrictions errors, as compared to error levels occurring in irrelevant information. A main effect emerged for work condition when causes and goals errors were made F (4,164) = 7.08, $p < .001$, with higher levels of causes and goals errors in processing overload work condition (M=3.31, SE=.08) versus the lowest levels of causes and goals errors when primed for irrelevant information (M=2.82, SE=.09). This may be due to the higher levels of

cognition required and therefore more time needed to engage in a search for causes and goals. Because of this, search of extant cases was highly influenced by processing overload due to lack of time for reflection. Irrelevant information work conditions may result in more alternative causes being revealed which may reduce causes and goals errors thereby explaining the low levels of causes and goals errors committed.

Insert Table 4 About Here

A similar main effect for work condition was found when contingencies and restrictions errors were made F (4,164) = 6.54, $p < .001$, with higher levels of contingencies and restrictions errors during processing overload work conditions (M=3.38, SE=.06) than irrelevant information work conditions (M=2.95, SE=.07). It appears that being in irrelevant information work conditions did not make much difference to the causes and goals and contingencies and restrictions errors made. These findings for contingencies and restrictions errors were similar to those found when causes and goals errors occur in the processing overload work condition, with more time needed to engage in the search of cases. These findings are consistent with previous research because leaders identify causes and goals in much the same way as contingencies and restrictions (Thomas & McDaniel, 1990; Mumford, et al., 2002).

There was a significant interaction between problem type and work condition where contingencies and restrictions errors F (4,164) = 2.50, $p = .05$ were being made more in processing overload work conditions (M=3.42, SE=.07) than in irrelevant information work conditions (M=2.89, SE=.08) for initiating structure problems. Similar results were found when

consideration problems were encountered with the processing overload work condition producing more contingencies and restrictions errors (M=3.35, SE=.07) than the irrelevant information work condition (M=3.01, SE=.08). Contingencies and restrictions require higher order processing which may be the reason this is impacted to such an extent in processing overload work conditions. There was no similar significant interaction found between problem type, work condition, and causes and goals errors. This pattern of results supported hypothesis one stating that errors are most often made in processing overload work conditions.

Analysis 2 Results

In the second MANCOVA examining the role of errors on performance outcomes in terms of creative problem solutions, intelligence and errors in consideration type problems yielded significant main effects F (1,126) = 14.27, p < .001, F (2,126) = 8.49, p = .001, respectively. A significant interaction was found between work condition and errors in initiating structure problems F (8,126) = 2.76, p < .01. These results can be seen in Table 5.

Insert Table 5 About Here

First, a significant main effect was found for individuals facing consideration problems with restricted capacity errors negatively influencing levels of solution performance F (2,126) = 8.49, p < .001. Lower levels of solution performance were produced when restricted capacity errors were made (M=2.01, SE=.09) than when contingencies and restrictions errors were made (M=2.47, SE=.08). When causes and goals errors were made, performance levels were between the two (M=2.42, SE=.10). This indicates that restricted capacity leads to poor solutions when

faced with consideration problems. Similarly, contingencies and restrictions errors also had less effect on measures of performance than restricted capacity errors. This is in support of hypothesis five indicating that restricted capacity errors would have the largest detriment on performance. There was no main effect found for initiating structure problems.

Next, a significant interaction was found between errors made in initiating structure problems and work condition on levels of performance F (8,126) = 2.76, p = .01. When processing overload was induced, level of performance was affected with low levels of performance when causes and goals errors were made (M=2.28, SE=.13). Even lower levels of performance were found here when processing overload was induced and restricted capacity errors were made (M=1.94, SE=.32). Levels of performance remained high when contingencies and restrictions errors were committed under the same work conditions (M=3.07, SE=.18). These findings are congruent with previous research (Mumford, Blair, Dailey, Leritz, & Osburn, 2006; Ayres, 2001) indicating a tendency to overlook new information when capacity is limited. When in causal relationships work conditions a similar pattern emerges with lowest levels of performance produced when restricted capacity errors were made (M=2.21, SE=.16) followed by contingencies and restrictions errors (M=2.35, SE=.20), and causes and goals errors (M=2.40, SE=.32). Slightly different results were found when primed for understanding constraints, with lower levels of performance found when causes and goals errors were committed (M=1.92, SE=.15) than if contingencies and restrictions errors were committed (M=2.09, SE=.24). In this instance though, performance levels were least affected when restricted capacity errors were committed (M=2.29, SE=.32).

Interestingly, the opposite finding is the case when subjects were in irrelevant information work conditions, higher levels of solution performance was obtained when causes and goals errors were committed (*M*=2.69, *SE*=.26) than when contingencies and restrictions errors were committed (*M*=2.00, *SE*=.19). When individuals committed restricted capacity errors, their performance scores fell between those found when causes and goals errors and contingencies and restrictions errors were made (*M*=2.55, *SE*=.22). It is apparent that thinking about irrelevant information and incorporating incongruent information into solutions provided assistance with performance levels when causes and goals errors were made. This was not the case when contingencies and restrictions errors were committed and participants were in irrelevant information work conditions.

In the control condition, levels of performance were at the lowest levels when causes and goals errors were made (*M*=2.13, *SE*=.17) followed by restricted capacity errors (*M*=2.36, *SE*=.13), and levels of performance were least affected when contingencies and restrictions errors were made (*M*=2.45, *SE*=.12). In the understanding constraints work condition, performance was also the lowest when causes and goals errors were made. In both of these work conditions, participants were not receiving information about searching for causes and goals within a case creating more severe outcomes when these case components were not fully understood. Generally speaking the control condition appears to act distinctly from other work conditions and does not simply follow a similar pattern to any of them.

Conclusions cannot clearly be drawn for hypothesis six because initiating structure problems had significant interactions with work condition but no significant main effects, and consideration problems had significant main effects but no significant interactions with work

condition. It would therefore appear that work condition is more important to the errors committed in initiating structure problems versus consideration problems. However we cannot state with certainty that errors occurring when working on initiating structure problems have a stronger negative influence on measures of performance than errors occurring when working on consideration problems. We can merely state that work condition played a significant role in the results for initiating structure problems, but not for consideration problems.

Discussion

Limitations

Before turning to the implications of this study, several limitations should be noted. First, this is an experimental study where individuals were placed in particular conditions. As a result, these findings do not necessarily speak to typical situations for leaders and caution is warranted when generalizing these findings to understanding planning behaviors and errors occurring in typical work environments. We believe, however, that this study provides a necessary foundation for further study of these specific combination effects. An experimental design such as this proved an important step to have control over the complex elements at play.

Next, this study was conducted in a university setting with undergraduates. Although, these undergraduates were engaged and able to perform the task, few have had experience leading an organization. Thus, the question remains as to whether these same results would be found if the study was conducted with a group of business leaders. However, the valuable information gained in this study will allow for the next study to take place in a more applied setting. Additionally, a lengthy study such as this would be difficult to coordinate in an applied

setting. With the knowledge gained from this initial study, a study in an applied study setting will not be so lengthy.

Also, although this study measured errors in terms of omission and commission, there is some ambiguity as to the underlying thought processes for omissions that were made. Specifically, individuals may have omitted necessary items in their responses that led to an error being recorded. However, they may have considered including them, but made a determination to exclude it from the problem solution. In sum, some of these thought processes may have been better than others, but we were unable to assess them with the current study design.

Finally, in business settings it generally takes some time to measure performance outcomes. Because of the static nature of the study, there may be more performance outcomes that could not be considered such as longevity of the solution which could only be evaluated many years after the decision was made.

Findings

Despite these limitations, we believe there are some noteworthy implications of this study to the area of leadership. Specifically, we have gained a better understanding of decision making and planning processes based on case based research. The main findings of this study indicate that 1) leader's work conditions and errors paired together have unique influences on performance, 2) not all leadership errors are created equally, and 3) what a leader is *not* focusing on in his or her work environment can cause performance problems.

The first finding that work condition and error in combination influence performance promotes our understanding of the unique influence of leader's work conditions on his or her decisions and performance. Therefore, it is not error alone that is related to performance

outcomes, rather it is work condition paired with error that influences a leader's performance. In effect, error acts as a moderator rather than a mediator variable in this study. This study contributes to the gaps in the literature by providing information about how error pairings with work conditions leaders experience influence various aspects of their performance. Key findings indicate that there were differences in each of these error pairings based on work condition and error type, which in turn influenced performance. Specifically the most detrimental pairings of error and work condition in terms of solution performance include: understanding constraints work conditions paired with causes and goals errors, processing overload work conditions paired with restricted capacity errors, irrelevant information work conditions paired with contingencies and restrictions errors, and causal relationships work conditions paired with restricted capacity errors.

When working under conditions of processing overload or analyzing causal relationships, restricted capacity errors had the most negative influence on performance in problem solutions. It is a logical result that capacity would become restricted under work conditions of processing overload. Although restricted capacity errors occurred less frequently than other errors they were consistently related to performance problems. When working under conditions of analyzing causal relationships, perhaps capacity becomes restricted because of the intense cognitive activity involved in synthesizing the information into coherent causal relationships. Restricted capacity errors may be particularly damaging to performance in these situations because of mental fatigue resulting in a tendency to attempt to arrive at a solution quickly. These solutions then are not as comprehensive or creative as they could be. This is a noteworthy finding for leadership research keeping in mind the often overlooked contextual factors. When individuals

were working in the irrelevant information condition, however, it was contingencies and restrictions errors that resulted in the most performance problems. It may be that exceptional leaders focus more naturally on contingencies and restrictions and this natural tendency is inhibited by thinking about irrelevant information. In this instance, contingencies and restrictions errors should certainly be taken seriously. Examining multi-level influences on leader errors and performance outcomes would be a valuable undertaking given the current results regarding the influence of work conditions.

The second main finding that not all leadership errors are created equally echoes previous findings in the aviation and medical fields (Cuschieri, 2003; Keith & Frese, 2008; Lorenzet, Salas, & Tannenbaum, 2005). Results clearly indicate that not all leadership errors are equal with both differences in the frequency of error types committed as well as differences in performance detriments resulting from different types of errors. In essence, it may be necessary to tolerate error in some areas because it is not as important to ultimate performance as other errors. For example, when causes and goals errors are made under work conditions of performance overload or causal relationships these errors will not have much influence on performance outcomes. This is of particular interest given the prevalence of action learning type leader development programs in existence that generally fall into the category of causal relationships type training (Groves, 2007). Although contingencies and restrictions errors occur most frequently in this study, it is not this error type that has the largest influence on performance problems. Identifying contingencies and restrictions is a common topic for leadership development perhaps due to the large number of errors occurring in this area. However perhaps leaders should not focus their scarce resources in that direction, rather they should focus on restricted capacity errors which do

have a strong negative influence across work conditions on levels of performance. Therefore, contingencies and restrictions errors may present an example of an error that should be overlooked in most situations. This is noteworthy in that leaders should focus their attention on those that have the most detrimental consequences. This has implications for our understanding of what is truly important in the leader decision making process.

Lastly, the third main finding that what a leader is *not* focusing on can cause problems has practical implications for leader development training. Therefore, it is of particular note that in certain instances it is the aspects least emphasized that are most important for performance and most influenced by what leaders think about. It is more accurate in general that an error is made because of what leaders are *not* thinking about rather than what they *are* thinking about. For example, contingencies and restrictions and causes and goals errors were most influenced by processing overload. Perhaps this is a result of the additional time necessary to engage in an adequate search and active analysis of cases (Licuanan, Dailey, & Mumford, 2007). This supports the finding by Moskowitz and Sarin (1983) that individuals tend to rely on known causal relationships when assessing a situation. When these more familiar causal understandings are not relevant, errors are made. Similarly, in processing overload situations leaders may not have the time to carefully assess restrictions which can be used in framing the problem. If there is insufficient time to correctly frame the problem, task performance is negatively influenced (Baughman & Mumford, 1995). If leaders can more quickly and accurately learn to identify contingencies and restrictions and causes and goals when faced with processing overload, it may help with the number of these types of errors that are made.

Participants in the understanding constraints work condition, who were thinking about contingencies and restrictions, had poor performance when causes and goals errors were made. Perhaps a leader's work condition, and subsequently where attention is directed, helps to reduce the occurrence of some error types and the resulting performance problems. Thus, being primed to think about contingencies and restrictions helped to avoid making contingencies and restrictions errors, or if these errors did occur they did not cause performance problems.

Since the aspects of a case that a leader is told to focus on may not necessarily be those that lead to improved performance, there is a need for a balanced approach. When leaders are asked to focus on a particular aspect of a case, other aspects are inhibited. Therefore, the resulting solution may be a more balanced type of training that focuses on many aspects important to decision making. Given the findings, there should be more emphasis on coping with the demands of processing overload rather than emphasis being placed on identifying causes and goals or contingencies and restrictions. In sum, there are several noteworthy conclusions for those involved in the development of leaders. It is not only important for trainers to realize what they are priming leaders to think about, but also what the leader is neglecting to focus upon. It may indeed be what the leader is neglecting that is relevant to the errors that are made rather than precisely what aspect of the situation the leader is focusing upon.

Future Research

The results of this study suggest a number of avenues for future research. For example, future research should study leaders working in incongruent information work conditions and investigate why contingencies and restrictions errors hurt performance in this instance while otherwise they do not. Additional studies may also consider variables that were not included in

this study. For example, it has been demonstrated in studies of medical errors that worry is a predictor of intentions to take precautionary actions (Peters, Slovic, Hibbard, & Tusler, 2006). Additionally, rather than necessarily choosing the best course of action, perhaps leaders settle on a solution that has a safety net thus remediating errors that could occur.

This study once again illuminates the importance of contextual factors in the study of leadership. Delving into the area of leader errors and realizing that error type must be considered in conjunction with work conditions will now allow for a study of leader errors to take place in a business setting and take particular note of the work conditions. Gaining a greater understanding of leader errors will not only promote our understanding of causal influences of performance detriments, but can allow us to alter work conditions so that the negative influences on performance can be minimized.

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Table 1. *Correlation Matrix Covariate Measures and Dependent Variables*

	1	2	3	4	5	6	7	8	9	10	11
1.Total Expertise	--										
2.Need for cognition	.15	--									
3.Wisdom	.14	.23**	--								
4.Extraversion	-.00	-.02	.04	--							
5.Agreeableness	-.08	.04	.09	.61***	--						
6.Conscientious	.05	.04	-.02	.66***	.61***	--					
7.Emotionality	-.07	-.12	-.15	.57***	.47***	.55***	--				
8.Openness	-.00	.06	.02	.64***	.55***	.59***	.47***	--			
9.Planning	-.10	.27**	-.01	.09	.15	.10	-.08	.07	--		
10.Divergent thinking	.21**	.08	.03	-.05	.05	.03	-.04	-.06	.12	--	
11.Intelligence	.02	.21**	-.04	-.03	.12	.13	.03	.18*	.29***	.18*	--
12.Initiating structure – causes and goals	.03	-.09	.07	.13	.04	.09	-.01	-.07	-.07	-.07	-.21**
13.Initiating structure – contingencies and restrictions	-.00	-.04	-.03	.06	.02	-.07	-.05	-.15	-.12	-.12	-.18*
14. Initiating structure – restricted capacity	.02	-.30***	-.06	-.02	-.03	-.02	.05	-.14	-.21**	-.09	-.22**
15.Consideration – causes and goals	-.12	-.19*	-.04	.03	-.08	-.02	-.01	-.09	-.16	.17*	-.25**
16.Consideration – contingencies and restrictions	-.11	-.03	-.09	.01	-.09	-.06	-.04	-.10	-.03	-.15	-.11
17.Consideration – restricted capacity	-.02	-.23**	-.07	-.03	-.06	-.06	.09	-.09	-.22**	-.13	-.12
18.Initiating structure - quality	.14	.20*	-.06	.00	.12	.15	-.07	.09	.29***	.23**	.33***
19.Initiating structure - originality	.14	.23**	.00	.01	.16*	.19*	-.01	.11	.24	.25**	.27**
20.Initiating structure – adaptability and reflection	.00	.18*	-.07	-.03	.10	.11	-.03	.04	.21**	.23**	.15*
21.Consideration - quality	.21**	.27***	.05	.12	.24**	.25**	-.01	.20*	.31***	.25**	.30***
22.Consideration - originality	.19*	.23**	.06	.09	.22**	.26**	.00	.19*	.28***	.27**	.23**
23.Consideration – adaptability and reflection	.13	.21**	.02	.09	.17*	.20**	.02	.13	.25**	.27**	.19*

Note. N=165. * $p<.05$; ** $p<.01$; *** $p<.001$.

Table 1 (cont.). *Correlation Matrix Covariate Measures and Dependent Variables*

	12	13	14	15	16	17	18	19	20	21	22	23
12.Initiating structure – causes and goals	--											
13.Initiating structure – contingencies and restrictions	.67***	--										
14. Initiating structure – restricted capacity	.44***	.39***	--									
15.Consideration – causes and goals	.72***	.47***	.43***	--								
16.Consideration – contingencies and restrictions	.55***	.73***	.32***	.49***	--							
17.Consideration – restricted capacity	.37***	.39***	.76***	.45***	.37***	--						
18.Initiating structure - quality	-.36***	-.28***	-.40***	-.33***	-.20*	-.43***	--					
19.Initiating structure - originality	-.28***	-.24***	-.37***	-.25**	-.15	-.37***	.89***	--				
20.Initiating structure – adaptability and reflection	-.24**	-.21**	-.34***	-.18*	-.11	-.36***	.78***	.74***	--			
21.Consideration - quality	-.22**	-.12	-.38***	-.39***	-.19*	-.43***	.72***	.66***	.52***	--		
22.Consideration - originality	-.18*	-.13	-.32***	-.33***	-.14*	-.38***	.64***	.65***	.54***	.90***	--	
23.Consideration – adaptability and reflection	-.13	-.13	-.38***	-.24**	-.14	-.40***	.62***	.59***	.68***	.77***	.76***	--

Note. N=165. * $p<.05$; ** $p<.01$; *** $p<.001$.

Table 2. *Factor Analysis of Performance Outcome Measures*

Consideration performance outcomes (37.58%; α = .93)		FL
1.	Quality – consideration	.88
2.	Originality – consideration	.88
3.	Elegance – consideration	.83
4.	Adaptability – consideration	.70
5.	Error avoidance – consideration	.63
Initiating structure performance outcomes (36.73%; α = .93)		
1.	Quality – initiating structure	.89
2.	Originality - initiating structure	.82
3.	Elegance - initiating structure	.72
4.	Adaptability - initiating structure	.78
5.	Error avoidance - initiating structure	.67

Table 3: *Results of Multivariate Analysis of Covariance for Error Frequency*

	F	*df*	*p*	η^2
Covariates				
Intelligence	3.59	4, 161	.01	.08
Main Effects				
Condition	9.29	4,164	.00	.19
Problem type	2.80	4, 161	.03	.07
Interactions				
Problem x condition	3.71	4, 164	.01	.08

Note: *F* = F ratio; *df* = degrees of freedom; *p* = significance level using Roy's Largest Root; η^2 = effect size estimate

Table 4: *Results of Analysis of Covariance for Error Frequency*

	Causes and Goals				Cont. and Rest.				Incongruent Info.				Restricted Capacity			
	F	*df*	*p*	η^2	*F*	*df*	*p*	η^2	*F*	*df*	*p*	η^2	*F*	*df*	*p*	η^2
Covariates																
Intelligence	11.03	1,164	.00	.06	2.72	1,164	.10	.02	9.57	1,164	.00	.06	5.71	1,164	.02	.03
Main Effects																
Condition	7.08	4,164	.00	.15	6.54	4,164	.00	.14	.90	4,164	.47	.02	1.95	4,164	.10	.05
Problem	.36	1,164	.55	.00	.53	1,164	.47	.00	2.82	1,164	.10	.02	1.95	1,164	.17	.01
Interactions																
Problem x cond.	1.97	4,164	.10	.05	2.50	4,164	.05	.06	.19	4,164	.94	.01	.63	4,164	.64	.02

Note: *F* = F ratio; *df* = degrees of freedom; *p* = significance level; η^2 = effect size estimate

Table 5: *Results of Multivariate Analysis of Covariance for Performance Outcomes* [a]

	F	*df*	*p*	η^2
Covariates				
Intelligence	14.27	1, 126	.00	.10
Main Effects				
Condition	.634	4,126	.64	.02
Errors for initiating structure problems	2.15	2, 126	.12	.03
Errors for consideration problems	8.49	2, 126	.00	.12
Problem	.13	1,126	.72	.00
Interactions				
Errors for init. struct. x condition	2.76	8,126	.01	.15
Errors for consideration x condition	1.15	8, 126	.34	.07
Errors for init. struct. x errors for cons.	.70	4, 126	.59	.02
Problem x condition	.66	4,126	.62	.02
Problem x errors for init. struct.	.73	2,126	.48	.01
Problem x errors for cons.	.16	2,126	.86	.00

Note: F = F ratio; *df* = degrees of freedom; *p* = significance level using Roy's Largest Root; η^2 = effect size estimate, [a] Three-way interactions are not reported due to sample size

Figure 1. *Case questions used for scoring*

Initial Questions – not scored
What are 5-8 strengths of this company?
What are 5-8 weaknesses of this company?"
Used to assess frequency and extent of errors committed
What 5-8 unforeseen events about the case are important to consider?
What 5-8 limitations about the case are important to consider?
What 5-8 details about the case are important to consider? Prioritize based on importance
What 5-8 key events in the case are important to consider?
What 5-8 desired outcomes in the case are important to consider?
Used to assess performance outcomes
If you were the leader of this company, what would you do?
What kind of actions would you take to turn this company around?
What kind of improvements would you implement?

Figure 2: *Rating Scales and Benchmark Examples*

Quality	Originality	Elegance	Adaptability	Reflection
5) Excellent rating: *"I would expect more out of myself. First, I would set goals the company should meet. Then organize the company so it will be time and quality efficient. I would talk to the employees. I would start looking to the future for new high quality ideas and try to get good reputation back." "I think the most important thing is to set goals, be optimistic, and not get too cocky. If you don't have a pathway you are going nowhere." "Specific requirements for employees. Hire a money manager for business. Get more advertisement/media for better reputation. Discover new ideas/technology for future."*	**5) Excellent rating:** *"Halt all rapid expansion, close unprofitable stores and focus on image and customer needs in current successful stores through remodeling and testing for new successful ideas." "Create new cash flows. Cater to the changing demographics possibly with new brand." "Create an Elite Food Katz for higher income customers. Improve on current processes to make them better and more efficient, then move forward with new ideas."*	**5) Excellent rating:** *"Create a new strategy for digital age. Find one segment that is profitable and that we could be the best at." "Find new investors that could provide new cash on hand to invest in innovation and design." "Improve on quality, image, range of products, cash flow."*	**5) Excellent rating:** *"Tell Andy to kick our company into gear and give him the tools and resources he needs. R&D heavily." "Build on the current success and pour resources into R&D." "Better accounting better publicity."*	**5) Excellent rating:** *"If I were the leader of Click-It, I would not have let the CEO of my company do this. I would not allow him to merge with the cell phone company. I do not think that this would aid him in the future for the reasons as follows: it would be difficult to persuade them by not realizing that their idea of structuring the company would consist as those of who would not be able to see the future goals of becoming a consumer-based company." "1. watch their financial situation. 2. budget their consumer bought goods. 3. retrieve ideas from other companies."*
4) Average to excellent rating:	**4) Average to excellent rating:**	**4) Average to excellent rating:**	**4) Average to excellent rating:**	**4) Average to excellent rating:**
3) Average rating: *"I would do my hardest to search for new technology products that incorporate tons of steel. Then I would come up with a budget plan. There is no problem with productivity or quality." "Spend many hours searching for new technology products and hiring people to help. Make trips to different companies to see who needs steel or could use it." "Improve management, better ideas to sell steel."*	**3) Average rating:** *"Dump as much debt as possible." "Have contract non-unionized workers to keep healthcare costs low to ensure that Aura could fire employees who are lousy." "New product design – new markets scheme – incorporate health savings plans for workers."*	**3) Average rating:** *"Use the kiddie cameras as a short term fix while we try to find a long-term solution." "Sell off parts of the company that cannot make profits anymore. Find a way to update technology to compete with rivals." "Technology improvements and company/employee morale."*	**3) Average rating:** *"Retire with what money I still had." "It's a sinking ship, changing focus is the only option." "Change to a different stable, shift focus to new technology.*	**3) Average rating:** *"Sell off assets, fire employees, start fresh." "Sell off assets, get back to the roots." "Focus more on details instead of just buying everything in sight."*
2) Poor to average rating:	**2) Poor to average rating:**	**2) Poor to average rating:**	**2) Poor to average rating:**	**2) Poor to average rating:**
1) Poor rating: *"Negotiate with the unions to not increase salaries until we can cover all our health care and pension expenses." "Develop a plan and stick to it." "Decreased costs and increased revenues."*	**1) Poor rating:** *"Probably try to merge, or grow in other areas besides acquisitions." "Find a way to grow besides acquisitions." "Invest in cell phones or high speed internet!"*	**1) Poor rating:** *"Developing a vision for the company that would lead us to become successful. I would implement the vision in all areas of the company."*	**1) Poor rating:** *"I would make it so that the workers were my first priority, besides pleasing the public." "Made sure that no one would be willing to forget ungrateful eye." "Making sure the key ideas were presented."*	**1) Poor rating:** *"Get a better marketing team." "Develop the marketing." "Work on the marketing and making the system more flawless."*

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